Bilkent University
CS 319 - Object-Oriented Software Engineering
Requirement Analysis Report
Group "Veni Vidi Code"

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1. Introduction

Gym usage in Bilkent University has always been maintained in the traditional way of handling all the needs with phone calls. Even though this sounds fairly simple at first, it might not be easy to keep track of everything and manage the programs and the reservations just by phone calls and using pen and paper.

Hence we felt the need for a simpler and better system and developed a web-based application which would make things easier not only for gym users but also for the gym staff. With this application, gym users can easily make reservations for gyms and participate in tournaments, while having an individual profile where they can record their personal information and request a gym program according to their needs. Gym staff on the other hand can keep track of the reservations, and also handle the gym usage by determining opening hours and a maximum number of reservations for a given time interval or a sports activity. They can also keep an eye on the users who do not show up for their reservations and restrict them from gym usage if it is necessary.

2. Proposed System

This application aims for having the simplest user interface with many various functionalities whose information was gathered by an interview with gym personnel (See Appendix A). All the students and the gym staff will be given accounts as Gym Member and Gym Staff respectively, created by the Admin user who is responsible for all the account creation and deletions.

Once a user logs in to the application with their accounts, they will find themselves on the home screen in which they can easily see and find any further operation. Gym members will have all the options from using the gym by making and canceling reservations to using sports facilities such as tennis courts or the football pitch. They can also register to available tournaments or request a personal gym program from the gym staff with only a few button clicks.

Gym staff on the other hand can see the details of all the reservations and adjust their daily life accordingly. Other than monitoring reservations and member-related options such as viewing members' profiles or checking all the members participating in a certain tournament; they also have all the authority to determine and edit gym and sports activity-related information such as determining the maximum number of members who can attend to a sports activity or determining the opening hours for the sports hall since there might have the need to make changes in some special situations such as holidays.

All users can easily achieve these functionalities in a few clicks and make all the operations they want to in a fairly short time.

2.1 Functional Requirements

2.1.1 Login

The login screen will be the initial screen once a user enters the app. Here users can successfully login to the app by using the credentials determined by an Admin user.

2.1.2 Home

Home screen will be the first screen a user sees once they successfully log in. This screen provides a user with numerous options which they can choose from. While gym members have all the options related to reservations and their gym program, gym staff will be given the options to manage the reservations and monitor some of the gym-related specifications such as opening hours and maximum quotas for certain sports activities.

2.1.3 Make a Reservation

Gym members can easily make a reservation by using this function. They can specify the time slot and the sport activity they want to make a reservation to.

2.1.4 Participate in a Tournament

Users have the option to participate in a tournament they wish to. From the list where all the available tournaments added by the gym staff are listed, users can choose a tournament and apply individually or form a team and then participate.

2.1.5 View Profile

Gym members can view their profiles and change/edit their attributes if they want to. Gym staff also have the option to view a member's profile so that they have a better understanding of the member if they ever need to write a personal gym program for them.

2.1.6 Request a Personal Gym Program

Gym members can request a personal gym program simply by clicking a button and this request can be seen by gym staff. Gym staff can then form a program for that user by visiting their profile and according to the user's personal attributes.

2.1.7 Cancel Reservation

Gym members can have the option to cancel a reservation they made earlier by simply clicking a button. This will also remove the reservation from the reservations list. Gym staff also have the option to cancel a member's reservation in the case of an inappropriate situation.

2.1.8 View Reservations

Both gym members and the gym staff can see all the reservations made, and make their program accordingly. While gym members can only see the reservations made by them, gym staff can see all the reservations made by any gym member.

2.1.9 View Gym Program Request

Gym staff can see all the gym program requests from all the users. Gym staff can also have the option to view the profile of the user who requested a gym program and can write a program by considering the user's physical attributes.

2.1.10 Determine Gym Specifications

Gym staff can have all the options related to gym and sports activities' properties. They can determine the maximum quota for an activity, determine opening hours for the gym and sports facilities (since there can be changes during holidays) and determine the latest day a member can make a reservation for a specific activity.

2.1.11 Tournament Operations

Gym staff can have the ability to announce a new tournament that will be visible for the gym member on the application. Also, gym staff also have the ability to view the participants of the tournaments.

2.1.12 Restrict Gym Member

Gym staff can restrict a gym member from using the gym and applying sports activities, in the case of inappropriate behavior or if the member does not show up for their reservations multiple times.

2.1.13 Add User

Admin user has all the authority to create an account for the system. Admin user can add a new user as a Gym Member or Gym Staff to the system by their email address, and this account can be later used by the user to login to the system. This functionality is most likely to be used when a new student enrolls to the university or a new gym staff is hired.

2.1.14 Delete User

Admin user also has the authority to delete an account from the system, by specifying whether they want to delete a Gym Member's or Gym Staff's account. This functionality is most likely to be used when a student graduates or a gym staff resigns.

2.2 Non-functional Requirements

2.2.1 Usability

Even though many of the students of Bilkent University might be familiar with using such technologies, it might not be easy for some of them or for the gym staff to understand and use a software program. Because of this, this application provides a pretty easy-to-use user interface, but with many functionalities.

After a simple login operation, all users are directed to a home page in which they can easily navigate to the option they would like to choose by various simple buttons and tabs. The home page and all the other screens are designed by using coherent colors since it visually looks more satisfying and it is proven that colors play an important role in learning and memorizing a new concept [1]. Once a user moves on to a new screen, they can again easily perform their action with simple clicks and any change will be updated on their screen automatically, for example, if a user makes a new reservation, it will be automatically added to the reservation list.

2.2.2 Reliability

All the information and credentials related to a user will be stored privately. Also, all the possible errors or exceptions will be handled in order to prevent unwanted program crashes

2.2.3 Response Time

Time is valuable for Bilkent University students. No one would like to waste more time than necessary on reservations or other gym functionalities when they just want to workout. This is already a problem at Bilkent University since gym staff may not be able to respond to phone calls sometimes.

Therefore, another aim of this application is to perform all the actions in the quickest time. Since all the data and information is to be stored on a simple database, users will access data easily and fast with simple queries that are handled in the background.

2.2.4 Supportability

It is always possible that addition or removal of a feature might be necessary, or things may go unexpected and there might need to improve the performance of the system.

Since this project is developed on GitHub, developers can easily contribute and work on different features without interrupting others. Also, the project will be written in a clean and easy-to-understand code supported with explanatory comments in order to make it easier for other developers to easily understand the structure. In addition to that, the whole project is supported with various UML diagrams and reports, hence anyone can easily understand the concept and contribute with their ideas.
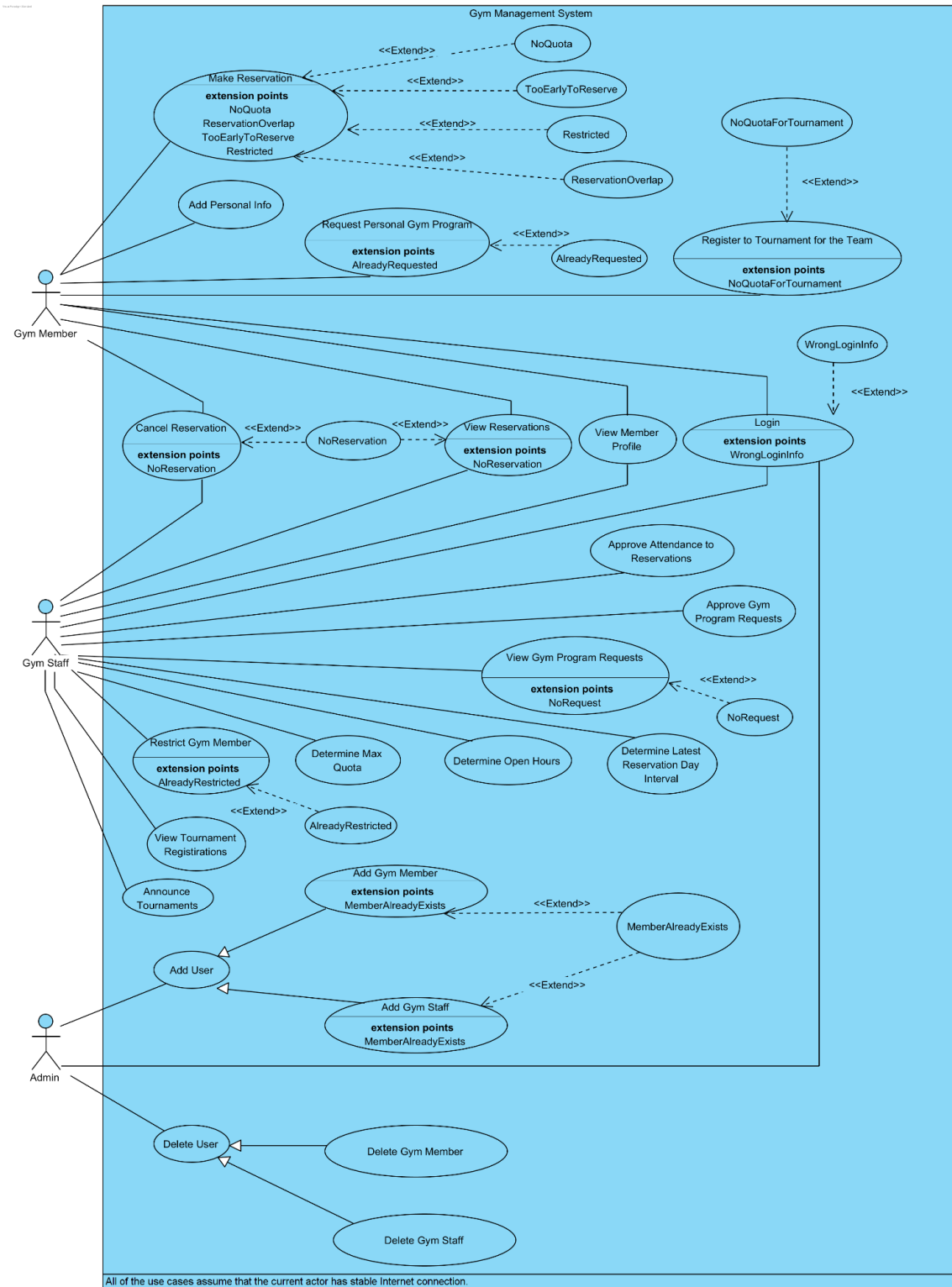
2.3 System Models [2]

2.3.1. Use Case Model

Fig. 1: General Use Case Diagram (Click here for bigger size)

For all of the uses cases below, two special requirements are:
- The actor must have a stable internet connection
- The server must be up and running

Name: Login

Participating Actors: Gym Member, Gym Staff, Admin

Entry Condition: Open the app

Exit Condition:

- Actor successfully logs in

Flow of Events:

1. Actor enters username
2. Actor enters password
3. Actor presses "Login" button

Special/Quality Requirements:

- Credentials must be valid

Name: Make Reservation

Participating Actors: Gym Member

Entry Condition: Actor clicks on "Make Reservation" button

Exit Condition:

- Actor successfully makes reservation or clicks "Back" button

Flow of Events:

1. Actor chooses the activity to make a reservation for.
2. Actor chooses a time slot.
3. Actor clicks on "Done" button

Special/Quality Requirements:

- Reservation for the chosen activity and time slot must be free
- User must not be restricted from making a reservation

Name: Add Personal Info

Participating Actors: Gym Member

Entry Condition: Actor clicks on "Add Personal Info" button

Exit Condition:

- Actor clicks "Save" button or clicks "Back" button

Flow of Events:

1. Actor chooses which information to edit
2. Actor edits the information(s)
3. Actor clicks on "Done" button

Special/Quality Requirements:

- None

Name: Request Personal Gym Program

Participating Actors: Gym Member

Entry Condition: Actor clicks on "Request Personal Gym Program" button

Exit Condition:

- Actor requests a gym program or clicks "Back" button

Flow of Events:

1. Actor requests a gym program by clicking "Request Personal Gym Program" button

Special/Quality Requirements:

- Actor must not had requested a gym program before

Name: Register to Tournament for the Team

Participating Actors: Gym Member

Entry Condition: Actor clicks on "Register to a Tournament" button

Exit Condition:

- Actor clicks "Back" button

Flow of Events:

1. Actor chooses a tournament among the available tournaments
2. Actor clicks on "Participate" button

Special/Quality Requirements:

- There must available quota for the chosen tournament

Name: View Tournament Registrations

Participating Actors: Gym Staff

Entry Condition: Actor clicks on "View Regsitrations" button

Exit Condition:

- Actor clicks "Back" button

Flow of Events:

1. Actor chooses a tournament from the tournament list
2. Actor can see all the participants.

Special/Quality Requirements:

- There must available quota for the chosen tournament

Name: View Member Profile

Participating Actors: Gym Member, Gym Staff

Entry Condition: Actor clicks on "View Profile" button

Exit Condition:

- Actor clicks "Back" button

Flow of Events:

1. Actor can see all the details and information about a user

Special/Quality Requirements:

- None

Name: Cancel Reservation

Participating Actors: Gym Member, Gym Staff

Entry Condition: Actor clicks on "Cancel Reservation" button

Exit Condition:

- Actor clicks "Back" button

Flow of Events:

1. Actor chooses a reservation among all the reservations made
2. Actor clicks on "Cancel this reservation" button

Special/Quality Requirements:

- There must be at least one reservation to cancel from

Name: View Reservations

Participating Actors: Gym Member, Gym Staff

Entry Condition: Actor clicks on "View Reservations" button

Exit Condition:

- Actor clicks "Back" button

Flow of Events:

1. Actor can see and scroll through all the reservations made

Special/Quality Requirements:

- There must be at least one reservation to view

Name: Approve Attendance to Reservations

Participating Actors: Gym Staff

Entry Condition: Actor clicks on "Manage Attendance" button

Exit Condition:

- Actor clicks "Back" button

Flow of Events:

1. Actor can see all the reservations and their reservers
2. Actor can approve or disprove the attendance by using a simple checkbox

Special/Quality Requirements:

- None

Name: View Gym Program Requests

Participating Actors: Gym Staff

Entry Condition: Actor clicks on "View Gym Programs" button

Exit Condition:

- Actor clicks "Back" button

Flow of Events:

1. Actor can see all the requests personal gym programs and their requesters

Special/Quality Requirements:

- There must be at least one personal gym program request

Name: Approve Gym Program Requests

Participating Actors: Gym Staff

Entry Condition: Actor clicks on "Approve Gym Programs" button

Exit Condition:

- Actor approves the gym program requests or clicks "Back" button

Flow of Events:

1. Once the actor is in the gym program requests list, they can approve a request simply clicking a button
2. Actor can either continue approving requests from the list or quit

Special/Quality Requirements:

- There must be at least one personal gym program request

Name: Determine Latest Reservation Day Interval

Participating Actors: Gym Staff

Entry Condition: Actor clicks on "Edit Latest Reservation Day" button

Exit Condition:

- Actor edits the latest reservation day or clicks "Back" button

Flow of Events:

1. Actor changes (or do not changes) the latest reservation day

Special/Quality Requirements:

● None

Name: Determine Open Hours

Participating Actors: Gym Staff

Entry Condition: Actor clicks on "Edit Open Hours" button

Exit Condition:

● Actor edits the open hours or clicks "Back" button

Flow of Events:

1. Actor changes (or not) the open hours of the gym or the sports facilities

Special/Quality Requirements:

● None

Name: Determine Max Quota

Participating Actors: Gym Staff

Entry Condition: Actor clicks on "Edit Max Quota" button

Exit Condition:

● Actor edits the open hours or clicks "Back" button

Flow of Events:

1. Actor can see all the list of all sports activities
2. Actor clicks one of the activity
3. Actor sets or changes a maximum quota for the chosen activity

Special/Quality Requirements:

● None

Name: Restrict Gym Member

Participating Actors: Gym Staff

Entry Condition: Actor clicks on "Restrict User" button

Exit Condition:

● Actor clicks "Back" button

Flow of Events:

1. Actor can see the list of all gym members
2. Actor chooses a specific gym member
3. Actor restricts (or not) the chosen member from using the gym and sports facilities

Special/Quality Requirements:

● The user to be restricted must not be already restricted

Name: Announce Tournaments

Participating Actors: Gym Staff

Entry Condition: Actor clicks on "Add a Tournament" button

Exit Condition:

- Actor clicks "Back" button

Flow of Events:

1. Actor can add (or not) a new tournament to the system

Special/Quality Requirements:

- None

Name: Add User

Participating Actors: Admin

Entry Condition: Actor clicks on "Add a New User" button

Exit Condition:

- Actor chooses the option of adding a new gym member or gym staff, or clicks "Back" button

Flow of Events:

1. Actor sees two options as adding a gym member or a gym staff
2. Actor chooses one of these two options

Special/Quality Requirements:

- None

Name: Add Gym Member

Participating Actors: Admin

Entry Condition: Actor clicks on "Gym Member" button

Exit Condition:

- Actor adds a new gym member to the system, or clicks "Back" button

Flow of Events:

1. Actor sets the username of the gym member
2. Actor adds the member by their mail address

Special/Quality Requirements:

- Member must not had been already added (mail address must be unique)

Name: Add Gym Staff

Participating Actors: Admin

Entry Condition: Actor clicks on "Gym Staff" button

Exit Condition:

- Actor adds a new gym staff to the system, or clicks "Back" button

Flow of Events:

1. Actor sets the username of the gym staff
2. Actor adds the gym staff by their mail address

Special/Quality Requirements:

- User must not had been already added (mail address must be unique)

Name: Delete User

Participating Actors: Admin

Entry Condition: Actor clicks on "Delete User" button

Exit Condition:

- Actor chooses the option of deleting a gym member or gym staff, or clicks "Back" button

Flow of Events:

1. Actor sees two options as deleting a gym member or a gym staff
2. Actor chooses one of these two options

Special/Quality Requirements:

- None

Name: Delete Gym Member

Participating Actors: Admin

Entry Condition: Actor clicks on "Gym Member" button

Exit Condition:

- Actor deletes a gym member from the system, or clicks "Back" button

Flow of Events:

1. Actor selects a user among all the gym members
2. Actor deletes the user (removes from the system)

Special/Quality Requirements:

- None

Name: Delete Gym Staff

Participating Actors: Admin

Entry Condition: Actor clicks on "Gym Staff" button

Exit Condition:

- Actor deletes a gym staff from the system, or clicks "Back" button

Flow of Events:

1. Actor selects a user among all the gym staff
2. Actor deletes the user (removes from the system)

Special/Quality Requirements:

- None

2.3.2. Object Models and Class Diagram
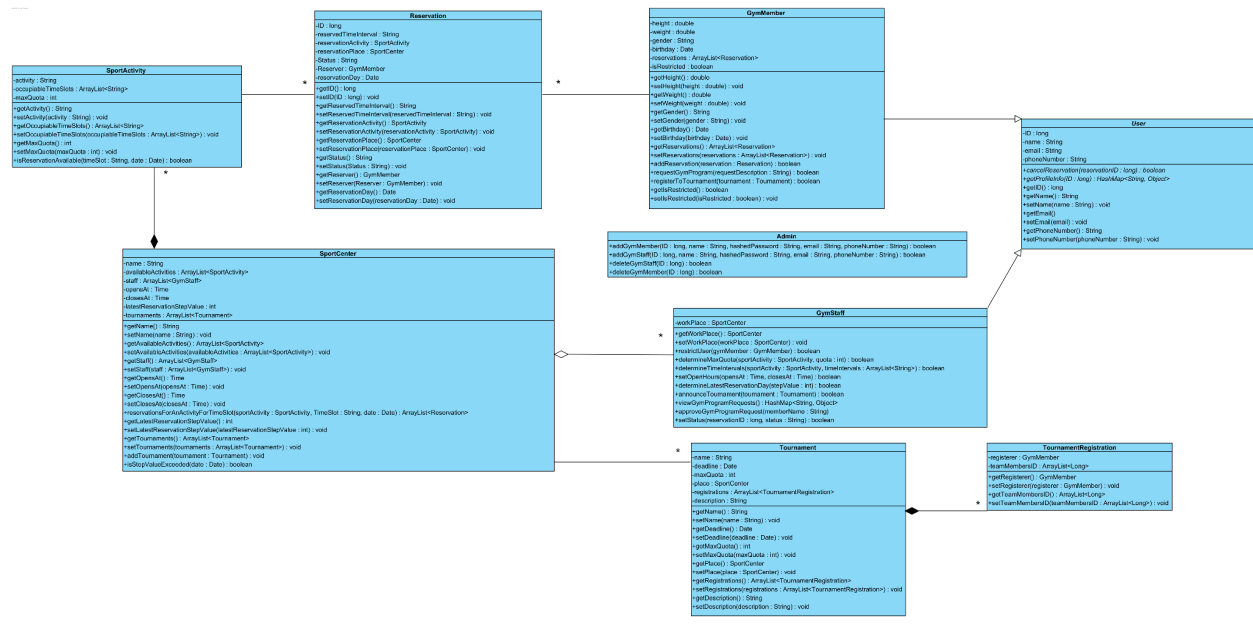
Fig. 2: Class Diagram (Click here for bigger size)

Explanation

The whole application can be thought to be handled by two main classes: *User* and *SportCenter*. As the name suggests, User class is mainly responsible for holding information about all the users who have access to the system. It also includes some operations related to reservations and consists of two classes: *GymMember* and *GymStaff*. GymMember is the basic user that is to be used by anyone who is willing to use the Bilkent University gyms and sports facilities. It has attributes related to a gym user's physical traits, and also allows the gym member to perform various operations such as making or canceling a reservation and or some other operations as well such as attending to a tournament. GymStaff class on the other hand is used to represent the staff working in Bilkent University gyms and sports facilities. They have access to various information about the gym and have the permission to change or edit them. There is also another class called *Admin*, which is separate from a regular user. Admin class represents a class for an admin user whose only task is to add new User's to the system.

On the other hand, SportCenter can be considered as the main class that is responsible for the operations related to sports activities and tournaments. It has GymStaff as the children class, hence the gym staff can also access the information related to these topics. Also, there can be many tournaments in the campus, hence the SportCenter class is in a 1-to-many association with the *Tournament* class. Tournament class is the class used to represent a single tournament with

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various attributes related to tournament details. There is also the *TournamentRegistration* class which is a part-of Tournament, which is used to display the participants and their information of a tournament if a tournament exists. Another class is *SportActivity*, which is a part-of SportCenter class, and represents a sports activity and its details. Finally, there is the *Reservation* class which holds all the information related to a reservation and includes some operations to retrieve those information of a particular reservation.

2.3.3. Dynamic Models

2.3.3.1 Activity Diagrams

2.3.3.1.1 Reservation Activity
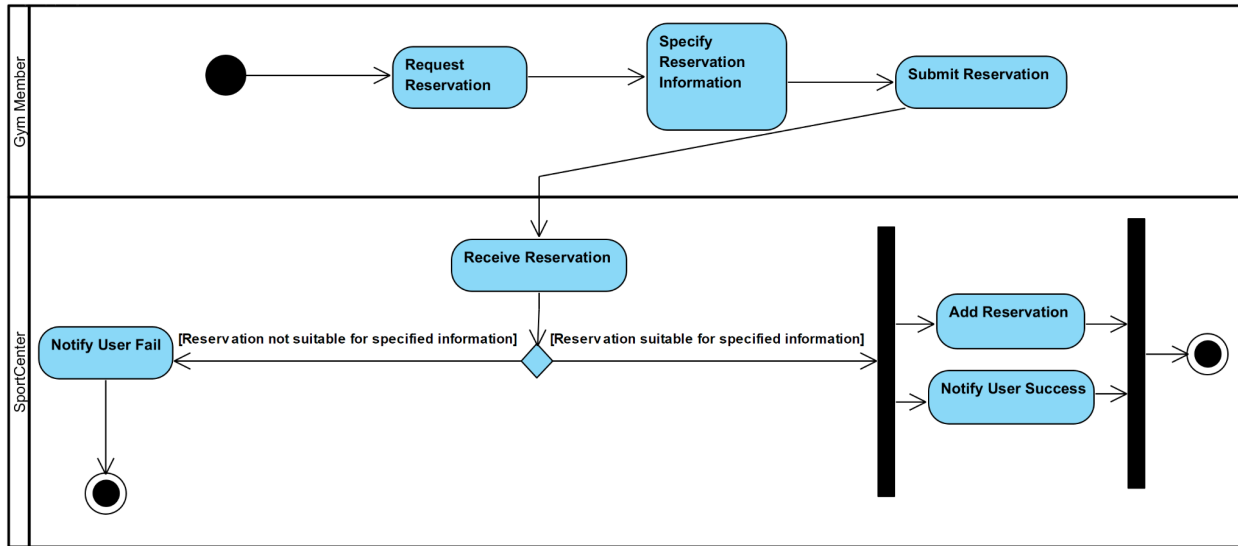
Fig. 3: Reservation Activity

When a gym member decides to make a reservation, they can easily do so by clicking the "Make a Reservation" button and then specify the reservation information such as when and which sports activity. Once they are done and submit, the SportCenter receives this request and checks whether it is suitable to make the reservation. For example if for that time slot the maximum number of gym members already have made a reservation or if the user has another reservation for that exact time slot, making a reservation operation is failed and the user is notified. Otherwise, the reservation is added to the system and the user is notified concurrently.

2.3.3.1.2 Tournament Activity
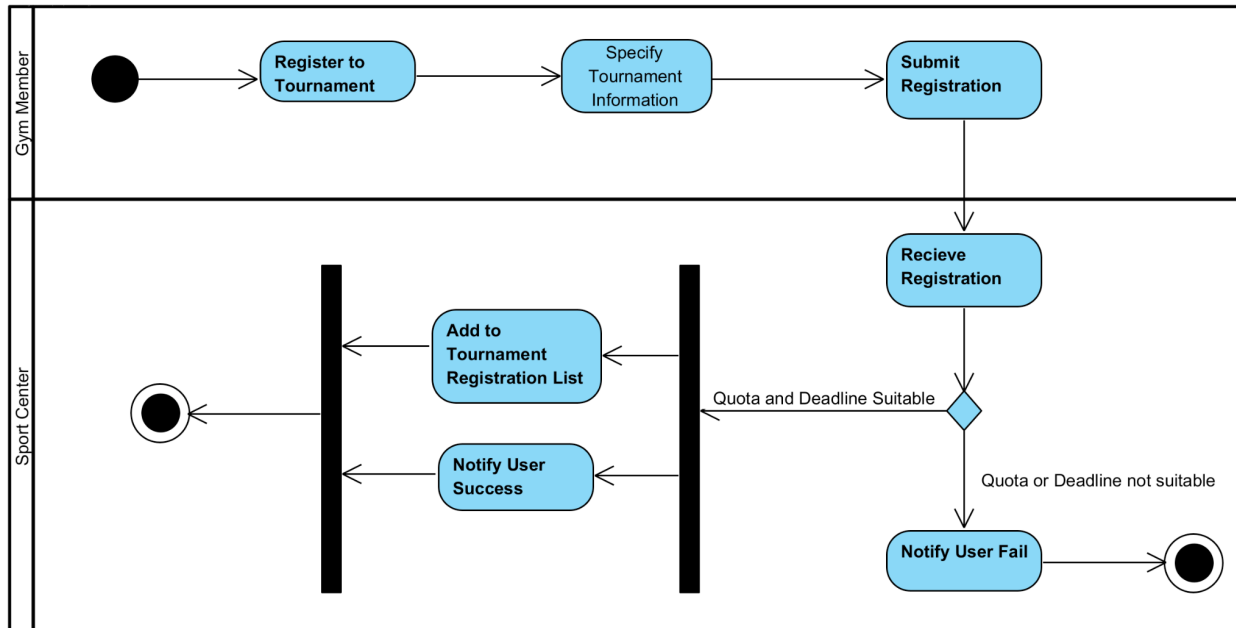
Fig. 4: Tournament Activity

If a gym member ever wants to participate in a tournament, they can click on "Register to a Tournament" and then choose the tournament they want to attend by viewing the tournaments' details. Once they make their decision, registration request is submitted to and received by the SportCenter. Then it is checked whether it is suitable to participate in the tournament or not. If not, the user is notified about the situation. Otherwise, the user is added to the registration list for that tournament and notified concurrently, and then the activity finishes.

2.3.3.1.3 Gym Program Activity
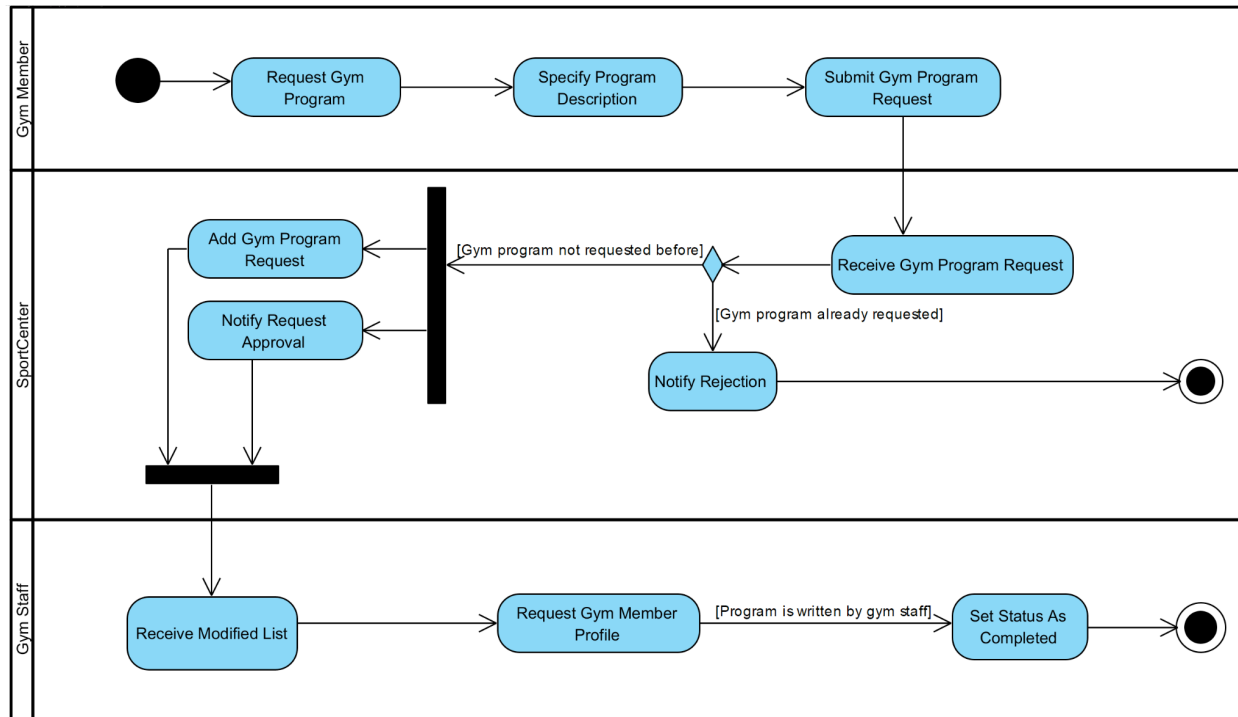
Fig. 5: Gym Program Activity

A gym member who wants to receive a gym program from the gym staff clicks on the "Request Gym Program", writes a detailed description of their needs, and submits a request to the SportCenter by simply clicking a button. Once the request is received, it is checked whether there has been a request by the same member before, and the request is rejected if that is the case. Otherwise, if this is the member's first request, request is added to the system and the gym member is notified concurrently, so that they are aware their gym program request is approved. Then, the gym staff has access to the updated list of all gym program requests, and from there they can access gym member's profiles. Once the gym staff writes the requested program activity finishes.

2.3.3.2 Sequence Diagram
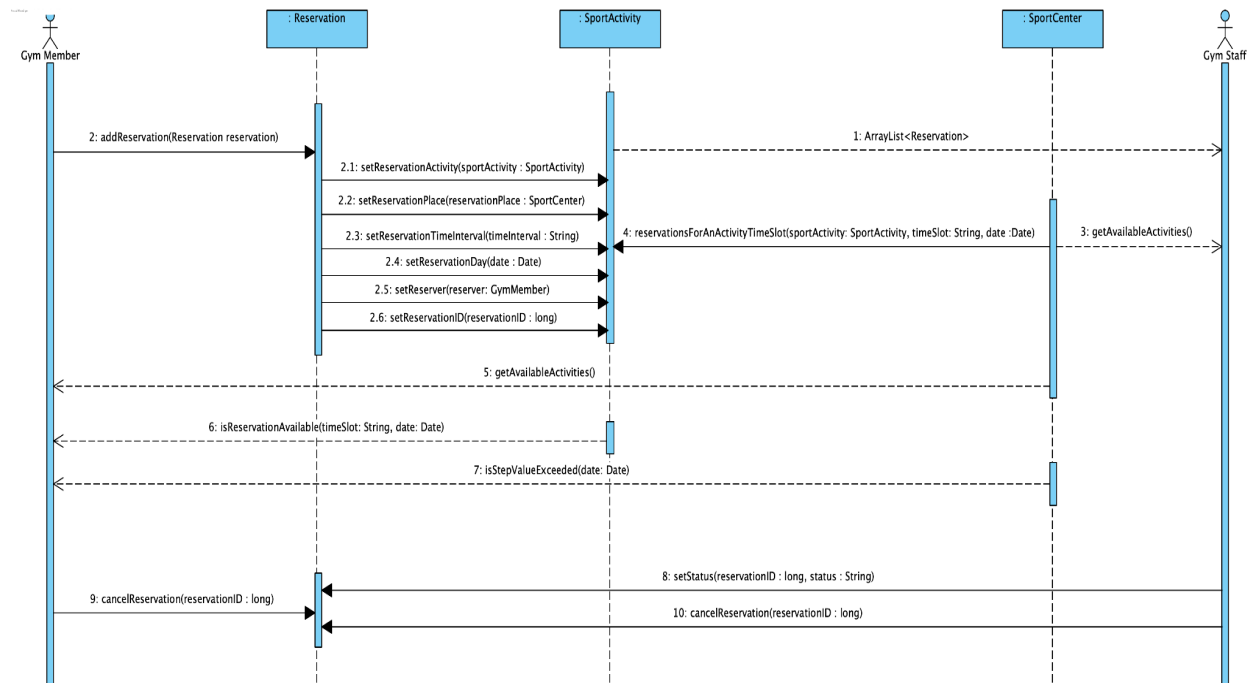
Fig. 6: Reservation Sequence Diagram

2.3.3.3 State Diagram
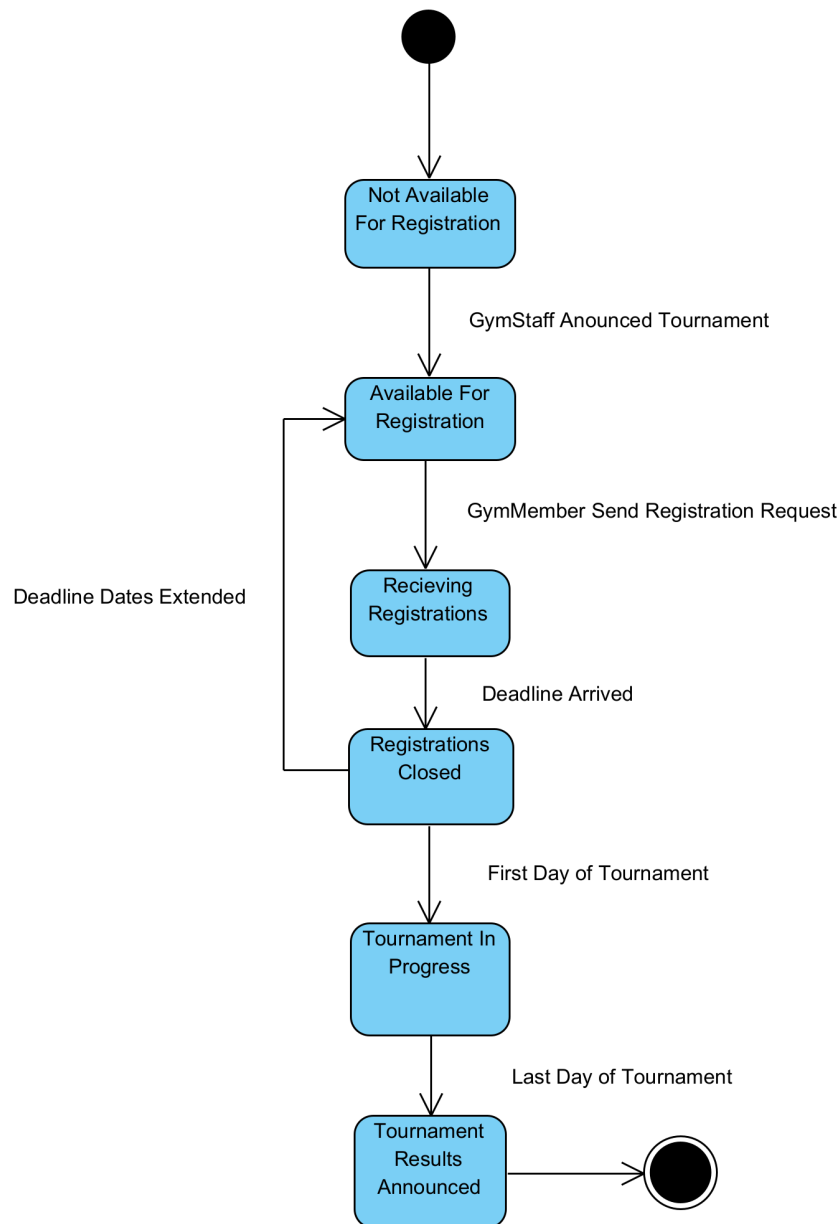
Fig. 7: Tournament Registration State Diagram

This diagram illustrates the states of a Tournament object. At first, when the tournament is not announced yet by a gym staff, its registrations are closed. Once the gym staff announces the tournament, the tournament moves on to the next state and it becomes available for registrations. During this state, gym members can register to the tournament and this moves the tournament object to the next state in which it receives registrations. Once the deadline specified by the gym staff arrives, tournamen's registrations get closed. During this stage, if the gym staff decided to extend the deadline, the tournament object moves back to the state where it is again available for registrations. If no deadline extension happens however, the tournament starts on the specified

starting day and hence the object moves to the next stage in which the tournament progresses. Once the tournament ends, the final state comes and the tournament results are announced.

2.3.4. User Interface

Fig. 8: Make a Reservation UI

| | Home | Reservation | My Profile | Tournaments | Sport Centers | Contact | | |

My Reservations

Make Reservation

Reservation Date	Reservation Time	Reservation Activity	Reservation Place	Status
March 19, 2022	11.30 - 12.45	Fitness	Dormitories Sport Center	Attended
March 25, 2022	14.30 - 15.45	Basketball	Main Campus Sport Center	Upcoming

Fig. 9: My Reservations UI

Fig. 10: My Profile UI

Fig. 11: Reservations UI from the eyes of Staff

3. Appendix

Appendix A - Interview with Gökmen Güner
Here is a translated version of our interview with Aydın Gökmen Güner who is sports facilities supervisor. S1 and S2 represent the group members.

S1: Hello Mr. Gökmen, thank you for your time firstly. We will make a project about gym management as a term project and we want to get information about the gym management system, its requirements, principles, and features that you want to have.

Gökmen Güner: Yes, of course. I would like to discuss the topic with you, guys. We need an application because it is hard to direct all of the parts of the gym. Your application can be useful for us.

S2: First of all, how does the reservation process work in the gym center? Are they handled by phone calls or is there any other way to make or cancel reservations?

Gökmen Güner: We get reservations from phones or in the gym center and we save them manually. If they want to cancel, they have to call us again and we delete their reservations manually again. Their reservation dates can be at most two days later from the current date, further dates are not allowed.

S2: Is there any punishment system for those who don't come at their reserved time?

Gökmen Güner: If they come to the gym at their reserved time, we mark their names manually. We don't have a punishment system yet for those who don't come at their reserved time.

S1: Then, if we talk more generally, what are gym facilities and features?

Gökmen Güner: We have three gym centers: East, Main, and Dormitories Gym Center. They have different facilities. I will generally talk about the Dormitory Gym Center. We have areas for the swimming pool, fitness center, ping pong, volleyball, basketball, football, box, and squash. The fitness center can be used by 40 people at the same time. Every fitness session has a period of one hour fifteen minutes. The swimming pool is for 6 people. There are 3 tables for ping pong. There are also 8 basketball hoops. Moreover, we have outdoor areas for activities. You can find other details which you can access on our website.

S2: How do we make sports course reservations? Can we make these reservations every time or is there any specified time for registration? If there is a specified time, how do users get notified about it?

Gökmen Güner: They cannot make reservations every time because these courses generally last at least three or four weeks. These are decided according to conditions. We send mail to users from BAIS to notify them.

S1: Thank you hocam, also we would like to ask if you have any suggestions for the system that you think is important? Your opinions are important for us.

Gökmen Güner: I think you can create my reservations page so users can see their reservations and they can cancel them easily. Also, you probably will need to separate the gym centers so that the users can make reservations to these different facilities independently.

S1 and S2: Thank you so much for your time Mr. Gökmen!

Gökmen Güner: My pleasure.

4. Glossary and References

[1] Chang, Bo; Xu, Renmei; and Watt, Tiffany (2018). "The Impact of Colors on Learning," Adult Education Research Conference. https://newprairiepress.org/aerc/2018/papers/30.
[2] Object-Oriented Software Engineering, Using UML, Patterns, and Java, 2nd Edition, by Bernd Bruegge and Allen H. Dutoit, Prentice-Hall, 2004, ISBN: 0-13-047110-0.